Global Climate Change, Local Hazards, and Opportunities in Jamaica Bay

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Brooklyn College
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Post-Sandy, Mayor Bloomberg convened the second New York City Panel on Climate Change (NPCC2), January 2013.

*Climate Risk Information 2013* (CRI Report) provided climate change science background for NYC’s Special Initiative for Rebuilding and Resiliency (SIRR).


Available online--New York Academy of Sciences

Technical science team lead by CCRUN, one of NOAA’s Regional Integrated Sciences and Assessments (RISA) groups.
Global sea level trends

Main sources since 1990s:
- ocean warming ~ 30-40%
- glaciers melting ~ 30%
- ice sheets: recent increase to >25%
- Proportions vary over this period!

1.7 ± 0.2mm/yr 1900-2010
3.3 ± 0.4 mm/yr 1993-2015

After Robert A. Rohde, from published data
IPCC, 2013; Nerem et al., 2010
www.sealevel.colorado.edu
Observed Sea Level Rise, 1856 - 2014
The Battery, New York

8518750 The Battery, New York 2.84 +/- 0.09 mm/yr

- Linear Mean Sea Level Trend
- Upper 95% Confidence Interval
- Lower 95% Confidence Interval
- Monthly mean sea level with the average seasonal cycle removed
Observed and Projected Temperature and Precipitation

Temperature Change (°F)
- >1.5
- 1.0 to 1.5
- 0.5 to 1.0
- 0.0 to 0.5
- -0.5 to 0.0
- -1.0 to -0.5
- -1.5 to -1.0
- ≤-1.5

Precipitation Change (%)
- >15
- 10 to 15
- 5 to 10
- 0 to 5
- -5 to 0
- -10 to -5
- -15 to -10
- ≤-15

Graphs showing historical and projected temperature and precipitation changes from 1900 to 2100, with different models and scenarios (RCP 8.5, RCP 4.5, high-estimate, low-estimate) for both temperature and precipitation.
Causes of Sea Level Change

- **Land water storage**
  - Groundwater mining,
  - impoundment in reservoirs,
  - urban runoff, deforestation,
  - seepage into aquifers

- **Vertical land motions**
  - Subsidence/uplift due to
  - glacial isostatic adjustment,
  - tectonics

- **Mass changes**

- **Thermal expansion**

- **Groundwater mining,** impoundment in reservoirs, runoff, deforestation, seepage into aquifers

- **Subsidence/uplift** due to
  - glacial isostatic adjustment,
  - tectonics

- **Glaciers and ice sheets**

- **Fingerprinting**
  - Gravitational,
  - Rotational,
  - Isostatic

- **Mass changes**

- **Ocean water**

- **Thermal expansion**

- **Local water density:** temperature, salinity

- **Ocean currents**
Sea level rise in New York City is very likely to accelerate as the century progresses.
NPCC2 Coastal Flood Heights and Recurrence Periods

Sea level rise is projected to cause an increase in coastal flooding

1-in-100 year Flood Heights (BASE HEIGHT: 11.3 FEET)

- **2020s**: 11.5'
  - **11.6-12.0''**
  - **12.1'**

- **2050s**: 12.0'
  - **12.2-13.1'**
  - **13.8'**

- **2080s**: 12.4'
  - **12.8-14.6'**
  - **16.1'**

The low estimate (10th percentile), middle range (25th percentile to 75th percentile), and high estimate (90th percentile).
### Annual Likelihood (1% Chance) of Today’s 100-year flood

Coastal flooding is very likely to increase in frequency, extent, and height as a result of increased sea levels.

<table>
<thead>
<tr>
<th>Annual chance of 100-year flood (1%)</th>
<th>Low estimate (10th percentile)</th>
<th>Middle range (25th to 75th percentile)</th>
<th>High estimate (90th percentile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020s</td>
<td>1.1%</td>
<td>1.1 – 1.4%</td>
<td>1.5%</td>
</tr>
<tr>
<td>2050s</td>
<td>1.4%</td>
<td>1.6 – 2.4%</td>
<td>3.6%</td>
</tr>
<tr>
<td>2080s</td>
<td>1.7%</td>
<td>2.0 – 5.4%</td>
<td>12.7%</td>
</tr>
</tbody>
</table>
The New York City Panel on Climate Change (NPCC2) Future 100-Year Flood Zones for New York City using high-estimate 90th percentile projections of sea level rise.

- 2020s: 10" Sea Level Rise
- 2050s: 30" Sea Level Rise
- 2080s: 58" Sea Level Rise
- 2100s: 75" Sea Level Rise
- FEMA Preliminary FIRM (December 2013)
- Borough Boundaries

Map Authors: L. Patrick, W. Solecki, August 2014. Contact: info@cunysustainablecities.org
Increasing Jamaica Bay and Rockaways Resilience to Higher Sea Levels

• Identify high risk flood-prone areas – new LIDAR mapping

• Incorporate sea level rise data into ecosystem management and preservation planning

• Create “soft” surge barriers—restore and raise beach dunes

• Create “soft edges” to dampen wave and tide energy – planting native vegetation; reducing land-sea slope

• Restore or create new wetlands, beaches, and offshore reefs

• Provide buffer zone for landward salt marsh migration